

**PRELIMINARY ASSESSMENT OF POLLUTION STATUS BY
PESTICIDES IN KAMALAVATI RIVER, SEDAM TALUKA,
KALABURAGI DISTRICT, KARNATAKA, INDIA**

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ABSTRACT

The present work is undertaken to provide about current pollution status of Kamalavati River Sedum Taluka Kalaburagi. The main object of the study is to carry out to determine the suitability of water for human consumption, agricultural uses, and other domestic uses. The samples were collected from five different stations I, II, III, IV, and V (Sedam city, Batagera, Ranjola, Bhutpur and Gundalli respectively) of the Kamalavati River for pesticide analysis.

Here we observed totally 11 pesticides among that 8 are insecticides (Deltamethrin-I, Profenofos, Aldrin, p, p'-DDE, p, p'-DDT, o, p'-DDT, Lambda-cyhalothrin, and Permethrin), 2 are fungicides (Carbendazim and metalaxyl) and 1 is herbicide (Butachlor). The result reveals that the condition of this river water is moderately polluted by the presence of pesticides.

KEYWORDS: Kamalavati River, Pesticides, Aldrin, Fungicides & DDT

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INTRODUCTION

Water is the most precious gift to all living organisms by nature. It is one of the most abundantly available natural resources in nature. We can't imagine our life without water because water is considered as the blood of all living organisms. Water is called the "universal solvent" because it dissolves more substances than any other liquid.

The various sources of water are rivers, lakes, ponds (freshwater bodies), seas, oceans (marine water bodies) and rain. Now a days the freshwater bodies get polluted directly or indirectly by the entry of pesticides from agricultural fields, which includes insecticides, fungicides, herbicides, fertilizers, etc.,

The term *cide* comes from the Latin word = 'to kill'. Pesticides are poisons designed to destroy unwanted life forms. Pesticides are usually used in agriculture field to protect crops against insects, weeds, fungi, and other pests. Use of pesticides plays a significant role in food production to increase yields and the number of times per year a crop can be grown on the same land.

Pesticides are usually toxic to all living organisms, it may be target organisms or non-target organisms. It can cause both acute and chronic health effects depending on the quantity and the ways in which a person is exposed. Use of some older and cheaper pesticides can contaminate the soil as well as water for years. Therefore

these pesticides have been banned in developed countries for agricultural use, but are still used (eg: aldrin, DDT, etc.,) in many developing countries. [www.safewater.org].

There are many ways through which pesticides enter the environment. It includes pesticide half-life, mobility in soil, solubility in water and high rainfall etc. Each pesticide has its unique property, some pesticides are soluble in water and some are insoluble in water. Those pesticides which are insoluble in water usually tend to stick to soil and also settle to the bottom of the surface water body, making it less available to organisms [pmep.cce.cornell.edu].

Hence, the present investigation of pesticides will give us detailed information to understand the current pollution status of the river.

MATERIALS AND METHODS

Study Area

The Kamalavati River is a perennial freshwater body of Kalaburagi district and located at Sedum taluka, which is 49 km away from the Gulbarga University Campus. It lies between Latitude of $17^{\circ} 10' 42.92''$ N and Longitude of $77^{\circ} 17' 23.93''$ E. This water is mainly used for agriculture. In addition to this, its water is also used for bathing animals, washing clothes and other domestic activities.

Sample Collection

Water sample was collected in 1L clean, amber-glass bottle. Bottles and lids were rinsed 2 or 3 times in sample water prior to collection and then water sample is filtered through $0.45 \mu\text{m}$ fiberglass filters to remove sand and debris (WHATMAN) [APHA 1985, Wilde FD 2005] after that cap the bottle with Teflon lined plastic lid and seal the cap with gummed tape and code the bottle, record the date, time. Some pesticides break down very quickly in water to avoid that, the sample must be kept in a refrigerator. [https://www.alcanada.com].

Samples were sent to the University Of Agricultural Sciences, Raichur. Pesticide Residue And Food Quality Analysis Laboratory, for analysis of pesticides. They analyzed the water sample by LC-MS/MS and GC-MS/MS.

Table 1: Pesticides Detected in Kamalavati River

Sl. No	Name of Pesticide	Result ($\mu\text{g/L}$)	Method of Analysis/ Technique
INSECTICIDES			
1	p, p'-DDE	0.002	GC-MS/MS
2	p, p'-DDT	0.006	GC-MS/MS
3	O, p'-DDT	0.012	GC-MS/MS
4	Aldrin	0.035	GC-MS/MS
5	Permethrin-1	0.004	GC-MS/MS
6	Lambda-cyhalothrin	0.002	GC-MS/MS
7	Deltamethrin-1	0.004	GC-MS/MS
8	Profenofos	0.007	LC-MS/MS
FUNGICIDES			
9	Carbendazim	0.095	LC-MS/MS
10	Metalaxyl	0.004	GC-MS/MS
HERBICIDE			
11	Butachlor	0.005	GC-MS/MS

RESULTS AND DISCUSSIONS

The present study reveals that the Kamalavati River is polluted by pesticides. Out of 70 various pesticides analyzed, in that 11 pesticides are detected, in that 8 are insecticides, 2 are fungicides and 1 is herbicide.

Insecticides

DDT

DDT was widely used during the Second World War and afterward for the control of disease vectors such as mosquitoes and for agricultural use, especially on cotton. DDT breaks down into DDE and DDD. In the environment, both DDD and DDE are also toxic and persistent [www.grconnect.com]. It is highly toxic to many aquatic invertebrate species and fishes also. Significantly DDT and its compounds are bioaccumulate in fishes and other aquatic species, leading to long-term exposure [WHO 1989].

A former study was carried out in 1995 on freshwater aquatic environments along with River Nile revealed that DDT, HCH, and PCBs were detected [Wahaab RA, PubMed].

DDT was banned from use in the U. S in 1972 and remains banned barring public health emergency (eg: outbreak of malaria)[ATSDR 1994].

Aldrin

Aldrin is a pesticide it is used to control soil insects such as termites, corn rootworm, wireworms, and grasshoppers. It is widely used to protect crops like corn and potatoes. It is readily changed to dieldrin in animals, plants, and environment. It bind very strongly to soil particles and very resistant to leaching into groundwater [www.popstoolkit.com]. Due to its persistent and bioconcentrate nature the EPA banned all non-termite uses of these chemicals in 1974, and all uses in 1987.

Permethrin-1

It is a pyrethroid insecticide registered by the United States Environmental Protection Agency (U. S. EPA) in 1979, and it was re-registered in 2006. These are synthetic chemicals that act like natural extracts from the chrysanthemum flower.

Using this pesticide is restricted because of their possible adverse effects on aquatic organisms [U. S EPA. 1987].

Lambda-Cyhalothrin

It is a pyrethroid insecticide registered by the U. S Environmental Protection Agency [(EPA) in 1988]. It is used to control the pests include aphids, Colorado beetles and butterfly larvae. It may be applied to some crops like cotton, cereals, potatoes, vegetables etc. It is also used to control disease-causing vectors such as cockroaches, mosquitoes, ticks, and flies [Royal Society of Chemistry 1991].

It is highly toxic to aquatic invertebrates and many fishes. Bioconcentration is possible in aquatic species but there is no bioaccumulation because it is highly toxic so it is quickly eliminated from the body of aquatic animals [U. S EPA 1988, U. S EPA 1992, and Royal Society of Chemistry. 1991]. Using of this pesticide is restricted due to its toxicity and so may be purchased and used only by certified applicators [Meister, R. T. (ed) 1992,].

Deltamethrin-1

Deltamethrin is an insecticide belonging to the family pyrethroids (WHO 1990). It is natural insecticide synthesized by using Chrysanthemum flowers. It is highly toxic to aquatic life, particularly fishes and when it reaches the soil, it has a great tendency to bind strongly to soil particles [npic.orst.edu].

Deltamethrin is registered for use on various crops including cotton, corn, cereals, soybeans, and vegetables for pests such as mites, ants, weevils and beetles [US. Dept of Health and Human Services, Agency]. The illegal, unregistered product known as “Chinese Chalk” or “Miraculous Chalk” can contain deltamethrin as the active ingredient [U. S Environmental Protection Agency].

Profenofos

It is an organochlorine insecticide. It was first registered in the United States in 1982. It is used on crops including cotton and vegetables, such as maize, potato, soybean, and sugar beet. According to WHO [2007], report found no adverse effects to workers of routine exposure to profenofos. Its use is moderately severe toxicity.

Fungicides

Carbendazim

It is a systemic broad-spectrum fungicide, world widely it is used against various fungal diseases of agricultural products. It is highly toxic to earthworms and moderately toxic to honey bees and aquatic organisms. Because it is moderately persistent in soil and very persistent in the aquatic environment. It is usually mixed with water and applied as a spray, as a drench or pre-planting drip. It is applied to beans, chickpeas, sugarcane, and cereal grains.

Metalaxyl

It is a systemic, benzenoid fungicide used in mixtures as a foliar spray for tropical and subtropical crops, as a soil treatment for control of soil-borne pathogens and as a seed treatment to control downy mildews [Kimmel, E. C.1986]. It is non-toxic to birds and freshwater fishes. A little amount of metalaxyl accumulates in the edible portion of fish. It is quickly eliminated after exposing to fresh water. EPA indicated that it possesses little threat to aquatic or terrestrial endangered species, it may be plants or animals [Walker, Mary M 1992].

Herbicides

Butachlor

Butachlor is a chloroacetanilide herbicide, it is widely used all over the world as pre-emergence control of unwanted weeds. These herbicides are highly toxic and persistent which entered the aquatic environment by agricultural run-off and leaching [Mirbagheri and Monfared 2009; Fenoll et al. 2011].

CONCLUSIONS

The overall view in this study reveals that the River Kamalavati is mainly polluted by pesticides. In this study, we detected some insecticides, fungicides, and herbicides. Here some pesticides are banned in some countries because of their bioconcentration and biomagnifications nature, but still, we are using these pesticides in our country. For example the presence of DDT in a trace amount in water it goes on increasing from lower trophic level to higher trophic level. This threatened to higher trophic level animals.

The main reason for water pollution by pesticide is removing the hedges in agricultural fields to increase the farmland area, continuously cultivating commercial crops to get more yields for that purpose applying maximum pesticides and fertilizers that lead soil erosion through which pesticides and fertilizers enter to the aquatic environment.

ABBREVIATIONS

μL^{-1} Microgram/liter

APHA American Public Health Association

DDD Dichlorodiphenyldichloroethane

DDE Dichlorodiphenyldichloroethylene

DDT Dichlorodiphenyltrichloroethane

EPA Environmental Protection Agency

GC Gas Chromatography

LC Liquid Chromatography

MS Mass Spectrometry

US United State.

WHO World Health Organization

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